RVK

ADDENDUM

REGISTERED LANDSCAPE ARCHITECT
LARRY A. HICKS
910
STATE OF TEXAS
4-7-11

Project:	Bonnie Connor Park (Hausman Phase III) San Antonio, Texas	Addendum No: Two
Owner:	City of San Antonio CIMS - Vertical - Parks Division P. O. Box 839966 San Antonio, Texas	Date of Issuance: April 7, 2011
Architect:	RVK, Inc. 745 E. Mulberry, Suite 601 San Antonio, TX 78212	RVK Project No.: 09076P

This addendum is hereby made a part of the construction documents to the same extent as though it were originally included therein. This addendum shall take precedence over the original construction documents where its provisions apply.

Item No. Description:

PROJECT MANUAL

GEOTECHNICAL STUDY

2.1 Geotechnical Study for the proposed Hausman Road Library, San Antonio, Texas, prepared by Fugro Consultants LP, shall be added to the project specifications manual. This report was furnished for the construction of the now complete John Igo Library that is on the same property as Bonnie Connor Park. This is the report referenced by Civil Engineer and Landscape Architect in the design of this project.

DRAWINGS

SHEET L1.00

2.2 Detail 1, Sheet L1.00 is mislabeled as 1"=60'-0" scale. Correct scale is 1"=30'-0".

SHEET L1.01

2.3 Detail 1, Sheet L1.01 is mislabeled as 1"=60'-0" scale. Correct scale is 1"=30'-0".

SHEET E1.00

2.4 Conflicting dimensions on Sheet E1.00 regarding light pole and fixtures. Mounting height specified is 30 ft. above finished grade. Description of pole is for 25 ft. height of pole, mounted on a 36 in. base. This adds up to 28 ft.; therefore, 30 ft. is not achieveable. <u>Solution:</u> Mount fixture as high as possible using the 25 ft. height pole.

Attachments:

Geotechnical Study, 8-1/2" x 11", 35 pages

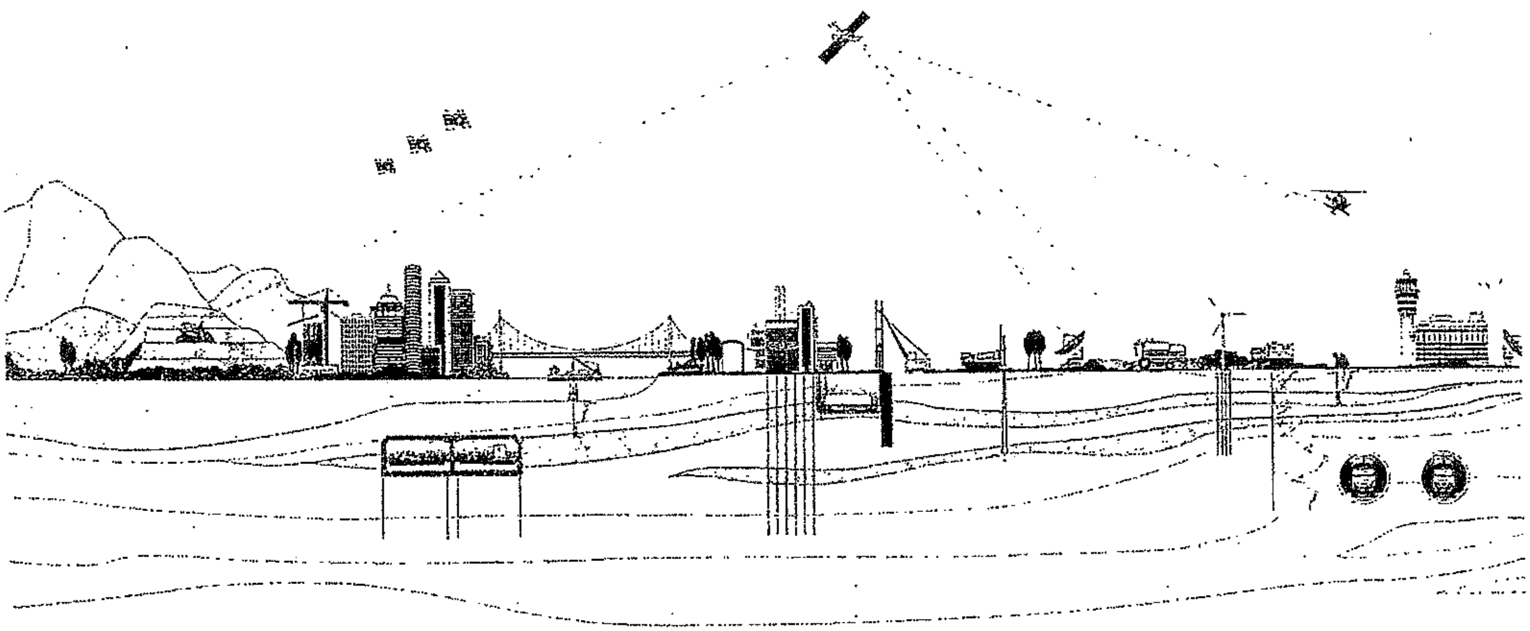
END OF ADDENDUM NO. TWO

05012

FUGRO CONSULTANTS LP

GEOTECHNICAL STUDY
PROPOSED HAUSMAN ROAD LIBRARY
SAN ANTONIO, TEXAS

CITY OF SAN ANTONIO
c/o Rehler Vaughn & Koone, Inc.
San Antonio, Texas



GEOTECHNICAL STUDY
PROPOSED HAUSMAN ROAD LIBRARY
SAN ANTONIO, TEXAS

* * *

Report

to

CITY OF SAN ANTONIO
c/o RVK Architecture
San Antonio, Texas

* * *

by

FUGRO CONSULTANTS LP
11009 Osgood
San Antonio, Texas

December 2005

FUGRO CONSULTANTS LP

Report No. 1005-0352
December 8, 2005

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San Antonio, TX 78233
Phone: 210-655-9516
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City of San Antonio
c/o Rehler Vaughn & Koone, Inc.
745 E. Mulberry, Suite 601
San Antonio, Texas 78212-3186

Attention: Mr. Heath Wenrich

Geotechnical Study
Proposed Hausman Road Library
San Antonio, Texas

Fugro Consultants LP is pleased to present this report to City of San Antonio on a geotechnical study conducted at the above-referenced site. This work was performed in general accordance with our Scope of Work document dated November 2, 2005.

This report contains foundation design recommendations and construction guidelines. The information obtained during the field and laboratory investigation of the study is also included.

Fugro Consultants LP, appreciates the opportunity to be of assistance to City of San Antonio on their ongoing projects. Please call if you have any questions, or if we may be of additional assistance.

Sincerely,
FUGRO CONSULTANTS LP

Marcus W. Horner, E.I.T.
Geotechnical Engineer

Rene P. Gonzales, P.E.
Sr. Geotechnical Engineer

STATE OF TEXAS
RENE P. GONZALES
86?59
LICENSED
PROFESSIONAL

RPG/MWH(p:\geotech05\0352rpt.doc)
Copies Submitted:
Mr. Heath Wenrich, RVK Architecture (3)
Mr. Shawn Franke, P.E., Lundy & Franke Engineering (1)

CONTENTS

(continued)

(continued)

ILLUSTRATIONS

SUMMARY

Fugro Consultants LP performed a geotechnical study for a new library for the City of San Antonio. This report documents the study. It contains a brief synopsis of the project, field exploration and laboratory tests results, and engineering recommendations. This summary provides an overview of the report and is not intended to present all pertinent information.

Subsurface conditions were explored by drilling seven exploratory borings. Laboratory tests were performed to measure the pertinent index and engineering properties of the foundation soils and rock. Results of the field and laboratory phases were then analyzed to develop geotechnical engineering recommendations to guide design and construction of the proposed retail store.

The principal findings and recommendations developed as part of this geotechnical study are summarized below:

1. The City of San Antonio is planning a new library on Hausman Road in San Antonio. The planned library will be about 15,000 sf in plan and will include various new drives and parking areas. At the time of our field investigation, the site was vegetated with scattered trees, underbrush, and natural grasses.
2. Subsurface stratigraphy encountered in the seven borings drilled for this study indicated about 2 to 4 ft of highly plastic 'fat' clay (CH) overlying moderately plastic lean (CL) to fat (CH) clays. Weathered Limestone of the Buda formation was encountered below about 8 to 13 ft. Although not encountered in our soil borings, it should be noted that the Buda is underlain by fat clays of the Del Rio formation.
3. The borings were advanced using dry auger drilling techniques. Groundwater was not observed in the borings.
4. Based on the results of the study, the planned structure should be supported free of grade on drilled pier foundations. A positive void space should be maintained between the ground surface and the pier-supported structure. Pier design and installation recommendations are presented in this report.
5. This site is suitable for either rigid (concrete) or flexible (asphaltic) pavements. Typical pavement sections for both of these pavement types are included in this report. No information on the type or frequency of vehicles using this facility was provided so the pavement sections are typical sections for similar facilities.

Additional recommendations and considerations to aid in foundation construction are also presented. Groundwater control, site drainage and construction monitoring are discussed.

INTRODUCTION

Project Description

City of San Antonio is planning a new library to be located at Hausman Road and Woller Road in San Antonio. The new building will be about 15000 sq ft in plan and will include new drive and parking areas. Detailed foundation loads are not known at this time. RVK Architecture will be providing the architectural design for the project. Franke & Lundy Engineering will be the project structural engineer.

On November 17, 2005, Fugro Consultants initiated a geotechnical study for the planned library facility. This geotechnical study was performed to provide engineering recommendations to guide design and construction of the foundation of the proposed building as well as the planned pavement areas. This work was performed in general accordance with our Scope of Work document dated November 2, 2005.

Purposes and Scope

The purposes of this study were to explore the subsurface conditions at the site and to develop recommendations for the design and construction of the foundations for the planned building. These purposes were accomplished by performing the following scope of work:

1) drilling and sampling seven exploratory borings to explore subsurface conditions and obtain samples for laboratory testing;

2) performing laboratory tests on selected soil samples from the borings to evaluate the pertinent physical and engineering properties; and

3) analyzing the field and laboratory data to develop foundation design and construction recommendations for the proposed building.

In general, field sampling, laboratory testing, and soil classifications and descriptions were in accordance with methods, procedures, and practices set forth by the American Society for Testing and Materials, 2005 Annual Book of ASTM Standards, where applicable.

Report Format

This report begins with descriptions of the subsurface investigation and laboratory testing programs. Findings from the field and laboratory programs follow in the section titled "Generalized Site Conditions." The subsequent section presents recommendations to guide design and construction of the foundations for the planned building. General pavement design recommendations follow. Concluding sections address construction surveillance and control, and the conditions of our recommendations contained in the report. Illustrations follow the text and contain: a vicinity map; a site plan; the boring logs presenting field and laboratory data; and plates explaining the terms and symbols used on the logs.

SUBSURFACE INVESTIGATION

Subsurface exploration borings were performed on November 17, 2005. The field program consisted of a total of seven subsurface exploration borings. Borings 1 through 5 were done within the building pad of the proposed structure to nominal depths of about 15 ft below the ground surface. The two remaining borings (Borings 6 and 7) were drilled in the planned parking areas to 5 ft. Total footage explored was approximately 78.1 ft.

The boring locations were selected by the design team and were provided to Fugro on a "concept site plan" provided by RVK Architecture prior to the field exploration. The locations were then staked by the field crew measuring from known landmarks at the site. The approximate locations of the borings are illustrated on a Plan of Borings presented on Plate 2.

Drilling

The sample borings were drilled with a truck-mounted drill rig equipped with the following sampling tools: (1) continuous flight augers for advancing the holes dry and recovering disturbed samples; (2) thin-walled tubes for obtaining undisturbed samples of cohesive strata (ASTM D 1587), and (3) split-barrel samplers and drive weight assembly for obtaining representative samples and measuring the Standard Penetration Test (SPT) N-values of noncohesive and hard cohesive soil strata (ASTM D 1586).

Sampling

In the borings, samples were generally obtained at about 2-ft intervals to a depth of about 10 ft and at 5-ft intervals thereafter to the completion depth. After recovery, each sample was removed from the sampler and visually classified by our field technician. Representative portions of each sample were then packaged, sealed, and transported to Fugro's San Antonio laboratory for testing.

Near surface cohesive samples from this site were recovered by hydraulically pushing a 3-in.-diameter thin-walled tube. The remaining soils were too hard to be sampled with the thin-walled tube and were sampled using a driven 2-in.-diameter split-barrel sampler in general accordance with the Standard Penetration Test (SPT) procedure. In addition to recovering the sample, the SPT blow count provides an indication of the strength of material.

The SPT N-value is the number of blows of a 140 lb drop hammer falling 30 inches required to drive the SPT sampler the final 12 inches of an 18 inch sampling interval. Where very dense material is encountered, the actual penetration after the initial 6 inches seating of the sampler is recorded for a total of 50 blows. The blows required for the first 6 inches of sampler penetration (seating) are usually not considered representative of in situ densities due to the possible presence of loose material or cuttings from the drilling operations. Failure to attain the initial 6 inches of sampler penetration with 50 blows is generally referred to as refusal and is identified on the boring logs as "Ref" for the indicated amount of sampler penetration.

Boring Logs and Sample Handling

During drilling and sampling, a record of field observations was maintained in the form of field logs describing the visual identification of the subsurface materials encountered, and other pertinent field data. These logs were later edited to incorporate information obtained from laboratory examination and testing. The final boring logs for Borings 1 through 7, thus developed, are presented on Plates 3 through 9, respectively. Keys to Terms and Symbols used on the Boring Logs are presented on Plates 10 and 11.

To aid in field classification, the undrained compressive strength of cohesive samples was estimated using a calibrated hand penetrometer, and the penetration resistance of the SPT sampler was recorded. The hand penetrometer values, in tons per square foot (tsf), and the SPT N-values, in blows per foot, are shown on the logs. The compressive strength estimate in tons per square foot (tsf) obtained with the hand penetrometer is equivalent to the undrained shear strength of the soil in kips per square foot (ksf).

After recovery, each sample was removed from the sampler, examined and visually classified by a soil technician. All field sampling and testing was performed in general accordance with the applicable ASTM standards. Representative portions of each sample were then sealed, packaged, and transported to our laboratory for further examination and testing.

Depth to Water

At the completion of the field exploration, the boreholes were sounded for groundwater using a weighted measuring tape. Any depth to water measurements are recorded on the boring logs.

LABORATORY INVESTIGATION

General

The laboratory testing program was directed toward identification and classification of the foundation soils and evaluation of the undrained shear strength, and primarily consisted of a series of standard classification and strength tests. To aid in soil classification, liquid and plastic limits, collectively termed Atterberg limits, and percentages passing selected U.S. Standard Sieves, were performed on selected soil samples. Water content measurements were made on selected samples to help establish the moisture content profile for each boring. Unconfined strength tests were performed on selected samples; and as part of those tests moisture content and unit weight measurements were performed on the same selected samples. The results of the laboratory classification tests are presented on the individual boring logs on Plates 3 through 9.

Review

Descriptions of strata made in the field at the time the borings were drilled were modified in accordance with results of laboratory tests and visual examination in the laboratory. All recovered soil samples were examined, classified and described in accordance with ASTM D 2487, ASTM D 2488 and Unified Soil Classification procedures. Classifications of the soils and finalized descriptions of subsurface strata are shown on the attached boring logs.

GENERALIZED SITE CONDITIONS

Site Description

The proposed library will be located at Hausman Road and Woller Road in San Antonio. At the time of our field investigation, the site was vegetated with scattered trees, underbrush, and natural grasses. The site grades downward from north to south. Preliminary grading plans, provided by RVK Architecture, indicate the existing grade at the proposed building pad slopes downward from north to south from about EL 979 to EL 974.

Site Geology

A review of available geologic information[1] indicates that the site is probably underlain by more than one geologic formation. The geologic map suggests a natural contact of the Buda and Del Rio formations may be present in the general area. Visual observations and the exploratory borings suggest that the proposed building pad is located over the Buda limestone.

The Buda is a dense, hard, fine-grained, buff or light gray limestone, tinged with blue or yellow, and on weathering, is locally blotched with red. It has a smooth conchoidal fracture, and is generally distinctly nodular. When intact, the Buda limestone generally provides relatively stable foundation conditions. Although clays of the Del Rio were not encountered during the field program. The Buda limestone is typically underlain by highly plastic clays of the Del Rio Formation.

The Del Rio formation consists largely of clay. It is greenish-blue in color, laminated, weathering to a dull yellow or brownish color. This formation may contain thin layers of arenaceous limestone (or thin limey flags), thin flags of shell breccia, gypsum and concretions of pyrite. This formation is also known to contain abundant fossils (exogyra).

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1 The University of Texas at Austin Bureau of Economic Geology, (1983), "Geologic Atlas of Texas, San Antonio Sheet".

The Buda and Del Rio materials would be expected to behave quite differently in terms of foundation conditions. The Del Rio soils would be expected to produce significantly greater shrink/swell movements than the Buda Formation. Locating a structure over the geologic contact increases the potential for differential foundation movements.

Seismicity

According to the Uniform Building Code, the seismic zone designation for the San Antonio area is Zone 0[2] indicating negligible seismic risk. The International Building Code (IBC)[3] provides guidelines the maximum considered earthquake spectral response accelerations at "short" period (S_{SM}) and 1-second period (S_{M1}), adjusted for site class effects. The following parameters have been developed from the IBC guidelines, taking into consideration the site-specific location and conditions.

Parameter	Value/Designation
Acceleration, S_{MS}, 0.2 sec spectral response	0.208 g
Acceleration, S_{M1}, 1 sec spectral response	0.078 g
Site Class	D

Stratigraphy

Subsurface conditions were explored at the site by seven borings. The borings encountered moderately plastic clays overlying limestone of the Buda formation. The clays were fat near the surface and generally became less plastic with depth. The subsurface conditions are described in the following paragraphs and have been generalized into the following major strata:

Stratum	Description
I	Brown Fat Clay
II	Tan and Gray Lean to Fat Clay
II	Tan Weathered Limestone

Stratum I. The upper fat clay layer was brown in color and ranged in thickness from about 2 to 4 ft. The clays were typically hard in consistency based on hand penetrometer readings over 4.5 ksf and an unconfined compression test results ranging from 8.5 to 12.2 ksf.

2 "Uniform Building Code", (1994), International Conference of Building Officials, Whittier, California, Fig. 16-2.

3 "International Building Code", (2003), International Code Council, Inc., Falls Church, Virginia, Section 1615, "Earthquake Loads – Site Ground Motion".

The material had measured liquid limits ranging from 54 to 64. The measured plasticity index ranged from 38 to 47. Based on correlations with the plasticity characteristics, the near-surface fat clays would be expected to have a very high potential for volume change (shrink/swell) resulting from moisture fluctuations[4].

Stratum II. The underlying soils consisted of tan and gray, moderately plastic clays. The soils were hard in consistency based on N-values ranging from 40 to over 50 bpf and an unconfined compression test result of 9.6 ksf. The clays ranged from lean (CL) to fat (CH) clays based on liquid limits ranging from 32 to 54 and PI's of 15 to 37. Various samples from about 8 ft exhibited distinctive physical, wax-like appearance indicative of highly expansive bentonite. The plasticity characteristics of the deeper tan and gray clays would indicate a high to very high shrink/swell potential. However, the moisture contents of the deeper clays at the site would suggest the material is currently in a relatively dry condition; therefore, it has the capacity to swell significantly.

Stratum III. An unweathered to slightly weathered limestone was encountered below the upper clays. The material was generally tan in color and interbedded with hard and soft layers. The N-values during SPT sampling would generally indicate the rock is strong. When intact, the Buda limestone generally provides relatively stable foundation conditions. Although clays of the Del Rio were not encountered during the field program. The Buda limestone is typically underlain by highly plastic clays of the Del Rio Formation.

Groundwater

All borings were advanced with dry auger procedures. No significant groundwater was observed within the depths of dry advancement. It has been our experience that groundwater is generally fairly deep in the area; however, some shallow perched water may be present at the interface of the clay and the limestone. It should be noted that fluctuations in groundwater level may occur, and the groundwater level may rise during extended periods of precipitation.

Variations in Subsurface Conditions

Subsurface conditions have been explored at the boring locations only. Since some variation was found in subsurface conditions at boring locations, all parties should recognize that even more variation may be possible between boring locations. In addition, the stratigraphy described above, and on the boring logs, is based on interpretation of the technician's observations during sampling, and classification of the samples. The boundaries between layers are approximate, and transitions between material types may be gradual.

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4 Peck, R.B., Hanson, W.E., and Thornburn, T.H., (1974) Foundation Engineering, Second Edition, John Wiley & Sons, Inc., New York, Pg. 337.

STRUCTURAL CONSIDERATIONS

The planned library will be about 15,000 sq ft in plan and will include various new parking and drive areas. The anticipated structures will likely be steel frame structure with a masonry exterior. Detailed foundation loads are not known at this time. Based on the variability of the subsurface conditions and the high potential for shrink/swell movements we recommend the planned structure be supported structurally free of grade on a drilled pier foundation.

FOUNDATION EVALUATION

General

A suitable foundation for any structure must satisfy two independent criteria with respect to the underlying foundation materials. First, the foundation must have an adequate factor of safety against exceeding the bearing capacity of the foundation soils. Second, the vertical movement of the foundation due to swelling or compression of the foundation material must be within tolerable limits for the structure.

Bearing Capacity Considerations

In general, the planned building will be founded on a moderately loaded foundation with respect to the net bearing pressures of the near-surface soils. Based on the results of our study, the soils at the site are suitable for shallow bearing support. However, the variation in subsurface conditions and the plasticity characteristics suggests the site soils will be susceptible to differential movements due to the shrink and swell of expansive clays. Based on the anticipated differential movements, we recommend the structure be supported free of grade. Design recommendations regarding the design and installation of deep foundation elements are presented in this report.

Foundation Movement Considerations

Vertical Movement (Shrink/Swell). Most problems resulting from plastic clays involve swelling as evidenced by upward heaving of the soil or structure, therefore, producing detrimental cracking. The difference between the field water content at the time of construction and the equilibrium water content finally achieved in the subsurface sometime after completion of the structures is the most important consideration in designed foundations established on soils with high swell potential. Heave values increase as the initial moisture content decreases. However, moisture contents and heave movements may vary to some extent (seasonally) even after equilibrium is reached.

As noted earlier, the plasticity indices for the near-surface fat clay soils encountered at the building pad site indicate a very high shrink/swell potential.[5] The underlying limestone would be expected to have little or no potential for volumetric change with moisture fluctuations. Estimates of soil swell at the site were evaluated using the Potential Vertical Rise[6] (PVR) method. The PVR estimate was computed to be on the order of 1½ to 2 inches. Average liquid limit and plasticity index (PI) values were used in the PVR calculation. Note that the PVR procedure derives potential swell from a historic PI versus swell curve. Therefore, the estimated swell values calculated using the PVR method may be different from actual measured movements that occur at the study site.

Surface Drainage. It is extremely important that future ponding or standing water around the structures should not be permitted. Surface drainage measures should be designed to positively direct water away from the building. Gutter and roof drains tied into a surface (not subsurface drainage system) that carries the water away and downhill from the building should definitely be part of the design. Drainage facilities should be properly maintained at all times.

DESIGN RECOMMENDATIONS

Based on the variability of the subsurface conditions and the high potential for shrink/swell movements we recommend the planned structure be supported structurally free of grade on drilled pier foundations. Detailed design recommendations are presented in this section. The design recommendations are grouped according to: drilled pier recommendations and pavement recommendations. Other construction considerations follow the pavement recommendations.

Structurally Suspended Foundation System

Based on the possibility of differential movements due to variable soil conditions encountered across the planned building pad, we recommend the planned library be supported free of grade on a drilled pier foundation system. The floor system should be designed with a well ventilated crawl space and exterior concrete retainers to maintain a minimum permanent 6-in. void below exterior beams. Details for design and construction of the drilled shafts are included in this section.

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5 Ibid.

6 McDowell, C., (1956), "Interrelationship of Load, Volume change, and Layer Thickness of Soil to the Behavior of Engineering Structures," <u>Proceedings</u>, Highways Research Board.

The drilled shaft capacities were developed using methods suggested by Reese and O'Neil (1988).[7] Allowable sidewall adhesion was selected using a factor of safety of about 2.0 with respect to undrained shear strength. Allowable end bearing values were based on a factor of safety of about 3.0. These values will provide some compatibility with respect to sidewall and shaft bottom movement. Generally, only a fraction of an inch of movement is required to develop full sidewall resistance, whereas considerably more movement is required to develop full end bearing.

Straight-sided drilled piers should be used at this site to support the structure. It is anticipated that most piers will be only moderately loaded. The piers should be socketed a minimum of 3 ft into the limestone stratum, and should not be less than 24 inches in diameter. Piers sized to these minimum requirements should have an allowable capacity of about 75 kips. Additional capacity can be achieved by additional socket into the rock.

When intact, the Buda limestone generally provides relatively stable foundation conditions. Although clays of the Del Rio were not encountered during the field program, the Buda limestone is typically underlain by highly plastic clays of the Del Rio Formation. It is imperative that Fugro be retained to confirm the conditions at the time of pier installation. Drilled piers bearing in the Buda and Del Rio materials would be expected to behave quite differently in terms of foundation conditions. The Del Rio soils would be expected to produce significantly greater shrink/swell movements than the Buda Formation. Locating a structure over the geologic contact increases the potential for differential foundation movements.

The following factors should also be considered during the design phase of the drilled shaft foundations:

Drilled Foundation Design Considerations:

1. Socket all drilled piers at least 3 ft into the underlying limestone. Based on the geotechnical borings, the required depth below final grade will vary across the site. Pier diameters should be a minimum of 24 inches. The piers may be designed using an allowable skin friction of 4 ksf in the rock socket. Additional axial capacity due to end bearing is available, if required. Any contribution from the overlying clays was neglected.
2. All heavy column loads and the tilt-up walls should be placed on the drilled shafts. A minimum permanent void space of 6 in. should be provided beneath the tilt-up walls.
3. Maintain a minimum spacing between drilled piers of at least three pier diameters. If this minimum spacing cannot be maintained, the foundation engineer should be retained to consider the group effect of closely spaced piers.

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7 Reese, L. C. and O'Neil, M. W. (1988), "Drilled Shaft: Construction Procedures and Design Methods," prepared for the U. S. Department of Transportation, Federal Highway Administration, Office of Implementation, McClean, Virginia, pp. 235-280.

4. The structural capacities of the drilled shafts should be checked for allowable stresses in the concrete, total downward axial loads, tension forces, lateral forces, and moments produced by dead plus probable maximum live loads.

Drilled Foundation Installation Considerations. The successful installation of drilled piers requires considerable care and skill. The following installation considerations should be noted:

1. Contract documents should include pay items for constructing the drilled foundations on a footage and unit price basis. The potential for variations in subsurface conditions may require deepening of shafts below planned bottoming elevation.
2. Based on the borings drilled for this study, more likely than not, groundwater will not be encountered during the construction of the drilled shafts at this site. However, caving and sloughing soils are expected, particularly in the near-surface fill material. Therefore, contract documents should provide for the use of temporary casing for proper installation of drilled shafts if detrimental drilling conditions are encountered.
3. The side walls of the drilled shafts should be horizontally scored throughout their length that is embedded in the rock strata with an out-set tooth on an auger to increase the effective roughness of the walls.
4. Before concrete placement, the foundation excavations should be inspected to ensure bottoms are clean and relatively free of water, and shaft sidewalls are clean of debris, properly scored, and free of auger smear, loose fragments, and any other materials deleterious to sidewall bonding.
5. To prevent deterioration of the sides and bottoms of pier excavations, reinforcement and concrete should be placed the same day drilling operations are completed.
6. Accurate records of pier depths, diameters, and locations (including off-center eccentricities) should be maintained.
7. Tremie or pumping should be used to place concrete in all drilled piers that extend to depths of 10 ft or more below the final construction grade.
8. As the design of any foundation relies heavily on generalizations drawn from subsurface conditions determined at a limited number of boring locations, verification of these generalizations at any given location should not be dictated by criteria based on depth or drilling resistance. Instead, the sides and bottoms of piers should be examined by Fugro Consultants, or their representative, to ensure that the expected side shear resistance and allowable end-bearing can be developed on cut faces.

Lateral Load Design Parameters

We understand various of the pier foundations will be subjected to lateral loading conditions. Lateral design loads and applied moments were not available at the time of this report. Fugro has developed lateral load shaft design parameters that may be used to analyze the drilled shafts.

The soil response parameters required for Lpile Plus[8] analysis will vary with depth. The program models the pile behavior using a finite difference method and determines the non-linear response of the soil using various soil resistance-pile deflection (p-y) criteria. The program accommodates the analysis of various pile types subjected to axial load, lateral load, and bending moments. If requested and authorized, Fugro can perform the LPile analysis. Our recommended parameters for the near-surface soils follow:

Depth (ft)	Soil Type	Undrained Shear Strength (ksf)	Effective Unit Weight (pcf)	Strain ε_{50}	Soil-Modulus, k (pci)		Friction Angle (degrees)
					Static	Cyclic	
0 to 5	Fat Clay	2	105	0.007	500	200	0
5 to 10	Lean Clay	4	115	0.005	2,000	800	0

Due to the potential for desiccation and drying of the near surface soils, we suggest the upper 5 ft of the Stratum I clays be neglected in computing the lateral load response. The deeper limestone may be modeled as a weak rock. Parameters for weak or highly fractured rock are included below.

Effective Unit Weight (pcf)	Young's Modulus, E_r (psi)	Compressive Strength (psi)	RQD (%)	Stiffness Factor, k_{rm}
130	500,000	500	0	0.0005

Lateral Earth Pressures

Parameters to estimate lateral loads on retaining walls and dock walls are presented in this section. We have assumed that the walls will be less than about 10 ft high. The lateral loads will depend on the fill type. The select backfill should extend behind the wall for a distance of at least 1.5 times the height of the wall. Lateral loads will develop on the walls due to (1) the self weight of the fill material, (2) surcharge loads imposed by the floor slab, and (3) applied live loads. In addition, large lateral loads may be induced if the wall backfill is not properly compacted. The following parameters may be used to estimate active lateral loads:

8 "LPile Plus 4.0 for Windows", Ensoft, Inc., Austin, Texas, 2000, License No. 501-122796.

Parameter	Crushed Limestone	Clayey Gravel	Clayey Sand	Clay
Unit weight, γ	130 pcf	130 pcf	125	120 pcf
Coefficient of lateral earth pressure, k_o	0.3	0.5	0.5	0.7
Coefficient of lateral earth pressure, k_a	0.2	0.3	0.3	0.5
Coefficient of surcharge pressure, k_s	0.5	0.5	0.5	0.5

The coefficient of lateral earth pressure should reflect either an 'active' state (k_a in the above table) or an 'at-rest' state (k_o in the above table), depending on whether or not movement is allowed. For unbraced temporary retention systems, an 'active' state is applicable. For permanent braced walls, the 'at rest' state should be used. Passive pressures should be neglected in the lateral earth pressure calculations. The retaining wall footings will bear on the natural soils or fill soils at the site. An allowable net bearing capacity of 2,000 psf can be used for any necessary strip footings. Friction along the base of the wall footings will develop resistance to sliding. A coefficient of base friction of 0.45 can be used for the select base material. An allowable adhesion value of 750 psf should be used for a clay subgrade

The earth pressure coefficients are based on the assumption that the area around the walls/foundations is well drained and that ponding is not allowed in these areas. If select backfill (crushed limestone or sand) is used, it should extend behind the wall for a distance of at least 1.5 times the height of the walls. To prevent the development of large lateral stresses, the backfill placed against walls should be compacted in thin lifts with hand-operated equipment. Weep holes should be provided to prevent the buildup of water. In addition, a drainage layer of permeable material should be provided behind the wall.

The equation and values presented above may be used for preliminary design of the retention system and the walls. Once the final system has been selected, Fugro Consultants should be retained to review the system and evaluate the lateral earth pressures for those specific cases.

Minimum Paving Recommendations

Over a period of time, pavements underlain by swelling clays, particularly flexible pavements if designed with some consideration of economics, will crack and undergo some deterioration and loss of serviceability. An allowance for maintenance such as patching of cracks and occasional overlays should be budgeted.

Pavement design was developed using AASHTO Guide for Design of Pavement Structures (1986) and traffic categories for parking lots, Baker (1975), modified to fit anticipated traffic conditions. Recommendations were formulated for various 18-kip equivalent axle loading (EAL) over a 20-year design life. A California Bearing Ratio (CBR) saturated strength of 3.0 was assumed for the subgrade soils at the site.

Flexible Pavement. Recommended thicknesses of crushed limestone base and hot mix asphaltic concrete (HMAC) for the anticipated traffic categories are set forth in the following table:

Traffic Category	Base Material Thickness, in.	HMAC in.
Light Duty	8	2.0
Heavy Duty	11	2.5

Construct the flexible pavement in accordance with the following:

1. Strip off at least 6 inches of the surficial brown dark clay soils (if present), and all organics, rubble, debris and soft spots. After stripping and excavation, the exposed subgrade should be proof rolled to identify weak or soft spots. These areas should then be excavated prior to placement of the new pavement. A geotechnical engineer should be retained to observe the condition of the exposed subgrade and proof rolling operations.
2. Scarify and compact the cut soil subgrade (if present) to at least 95% of the maximum dry density determined using TxDOT Test Method TEX-114-E. Maintain water contents during construction at wet of optimum moisture content.
3. If fill material is necessary to raise the parking area to rough grade, the material used should be a lean clay (CL), clayey sand (SC), or clayey gravel (GC) according to the Unified Soil Classification system. The material should be compacted to at least 95 percent of the maximum dry density determined using TxDOT Test Method TEX-113-E. Maintain water contents during construction at near or slightly above the optimum moisture content.
4. On the prepared subgrade, place the recommended thickness of crushed limestone flexible base material which conforms to Type A, Grades 1 or 2, Item 247, of TxDOT, 1993 Standard Specifications for Construction of Highways Streets and Bridges. Compact the crushed stone base to 95% of the maximum dry density determined using TxDOT Test Method TEX-113-E and a laboratory compactive effort of 13.26 ft lbs/cu in. Maintain water contents near to optimum so as to allow the specified percentage of compaction. Maintain compacted lift thickness to 6 inches or less.
5. Apply a seal coat using AC-5, AC-10, or an emulsified asphalt with Grade 4 precoated aggregate. Place the seal coats in general accordance with TxDOT Standard Specifications Item 316.

6. Place the recommended thickness of Hot Mix Asphaltic Concrete in conformance with Item 340 of TxDOT, 1993 Standard Specifications for Construction of Highways Streets and Bridges.

7. Parking areas should be properly graded in order to drain surface runoff away from the building and parking area.

8. To protect the pavement from subgrade and base failure, the pavement design should incorporate a curb system to protect shallow seepage water from entering laterally into the pavement base course. The curb system should extend to a depth below the bottom of the base course.

9. A reinforced concrete pad, large enough to accommodate all wheels of garbage trucks lifting and dumping large refuse containers, is recommended for garbage pick up areas to prevent rapid deterioration of pavements. Use 7 inches of reinforced concrete over the 4 inches of crushed stone flexible base. Compact subgrade and base material as detailed above.

Rigid Pavement. The following recommendations are made for the design and installation of rigid pavement:

1. Strip off at least 6 inches of the surficial brown dark clay soils (if present), and all organics, rubble, debris and soft spots. After stripping and excavation, the exposed subgrade should be proof rolled to identify weak or soft spots. These areas should then be excavated prior to placement of the new pavement. A geotechnical engineer should be retained to observe the condition of the exposed subgrade and proof rolling operations.

2. Scarify and compact the cut soil subgrade to at least 95 percent of the maximum dry density determined using TxDOT Test Method TEX-114-E. The upper 6 inches of subgrade should be treated with at least 5 percent lime, by dry weight. Hold water contents wet of optimum, but within a range that will allow the specified percentage of compaction.

3. If fill material is necessary to raise the parking area to rough grade, the material used should be a lean clay (CL), clayey sand (SC), or clayey gravel (GC) according to the Unified Soil Classification system. The material should be compacted to at least 95 percent of the maximum dry density determined using TxDOT Test Method TEX-113-E. Maintain water contents during construction at near or slightly above the optimum moisture content.

4. In areas subject to automobile and light truck traffic, place a minimum thickness of 5 inches of reinforced concrete pavement. Use 7 inches of reinforced concrete in areas of heavy truck traffic (i.e., delivery trucks, trash trucks, or front loading trash dumpsters). The concrete is to have 4,000 psi compressive strength at 28 days. Slip form concrete design should have a maximum slump of 4 inches. Concrete should be cast and placed within the guidelines set forth by the American Concrete Institute (ACI).

5. Reinforce the concrete pavement using No. 3 reinforcing bars, placed at 18-inch centers, each way. Arrange, space and securely tie bars and bar supports (chairs) to hold reinforcement in position during concrete placement

operations. To improve performance, the chairs should be constructed of plastic material. The chairs should support the reinforcing steel to achieve a minimum of 2 inches of concrete cover. Ideally, the reinforcement should be located 2 inches above the bottom of the concrete slab.

6. Experience indicates that reinforced concrete pavements with joints on 20-ft spacing, cut to a depth of at least one-third of the pavement thickness have generally exhibited less uncontrolled post-construction cracking than pavements with wider spacings. Joints should be sawed within 18 hours of concrete placement. We recommend sealing joints with rubberized asphalt or silicate sealer. Frequent use of expansion joints will improve pavement performance. As a minimum, expansion joints should be used wherever the pavement will abut a structural element subject to a different magnitude of movement, such as: light poles, retaining wall, or manholes. After construction, the expansion and construction joints should be inspected periodically and resealed, if necessary.
7. Parking areas should be properly graded in order to drain surface runoff away from buildings and parking areas.

CONSTRUCTION CONSIDERATIONS

Excavations and Grading

As part of the construction, various excavations may be performed at the site. Analysis of the excavatability of the site was beyond the scope of this study. However, excavations at the site may encounter competent rock, which will be difficult to excavate using conventional earth-moving equipment. The sitework and excavating contractors should be prepared for rock at shallow depths and have appropriate equipment, such as rock saws and hoe rams. All OSHA trench safety guidelines should be strictly followed during excavating operations.

Groundwater Control

Groundwater seepage is not anticipated for shallow excavations at the site. Groundwater was not observed during the drilling of the borings. However, localized groundwater levels may rise during times of wet seasonal conditions. If groundwater seepage does occur in construction excavations, this seepage can, more likely than not, be pumped from the excavation.

Site Drainage

The optimum performance of any foundation system is dependent on positive site drainage. It is essential to the future performance of the recommended foundation systems that positive drainage of all storm waters away from foundations be included in the design of this project. Parking lots and service drives should be designed to prevent the ponding of water either on or along the edges of the pavements and curbs. This positive drainage should be carefully maintained throughout the life of the building.

The contractor should provide for positive drainage of the site during construction. This consideration should be included in the project specifications.

Construction Surveillance and Control

Engineering overview and on-site surveillance during subgrade preparation, fill placement and compaction, and grade beam and pier construction is essential to provide a well-constructed system. For the site preparation anticipated at this site, we recommend these construction activities be monitored by Fugro to provide the necessary overview and verify the intent of our recommendations. These subgrade preparation services would include monitoring and testing of fill placement and compaction, and field observations and laboratory testing to evaluate the quality of construction materials. We would be pleased to discuss a scope of work with you and submit a proposal to provide these services.

CONDITIONS

Since some variation was found in subsurface conditions at boring locations, all parties involved should take notice that even more variation may be encountered between boring locations. Statements in the report as to subsurface variation over given areas are intended only as estimations from the data obtained at specific boring locations.

It is recommended that, upon completion of the plans and specifications and the incorporation of the recommendations herein, Fugro Consultants LP, be retained to review such plans to insure proper interpretation and implementation of the recommendations contained in this report in the interest of the best compromise between cost and performance.

The professional services that form the basis for this report have been performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in the same locality. No warranty, expressed or implied, is made as to the professional advice set forth.

The results, conclusions, and recommendations contained in this report are directed at, and intended to be utilized within, the scope of work as presented in this report. This report is not intended to be used for any other purposes. Fugro Consultants LP makes no claim or representation concerning any activity or condition falling outside the specified purposes to which this report is directed, said purposes being specifically limited to the scope of work as defined in said report. Inquiries as to said scope of work or concerning any activity or condition not specifically contained therein should be directed to Fugro for a determination and, if necessary, further investigation.

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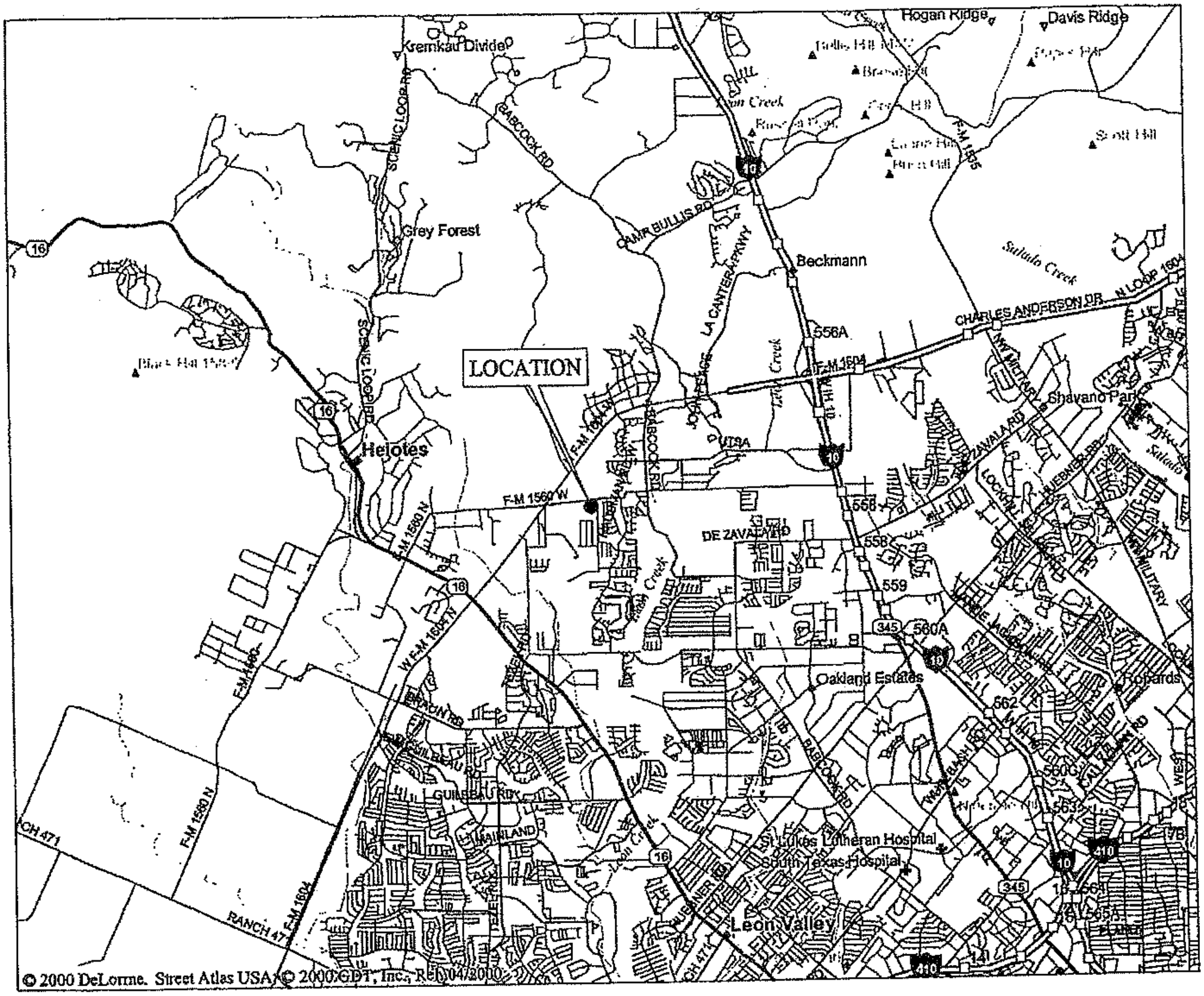
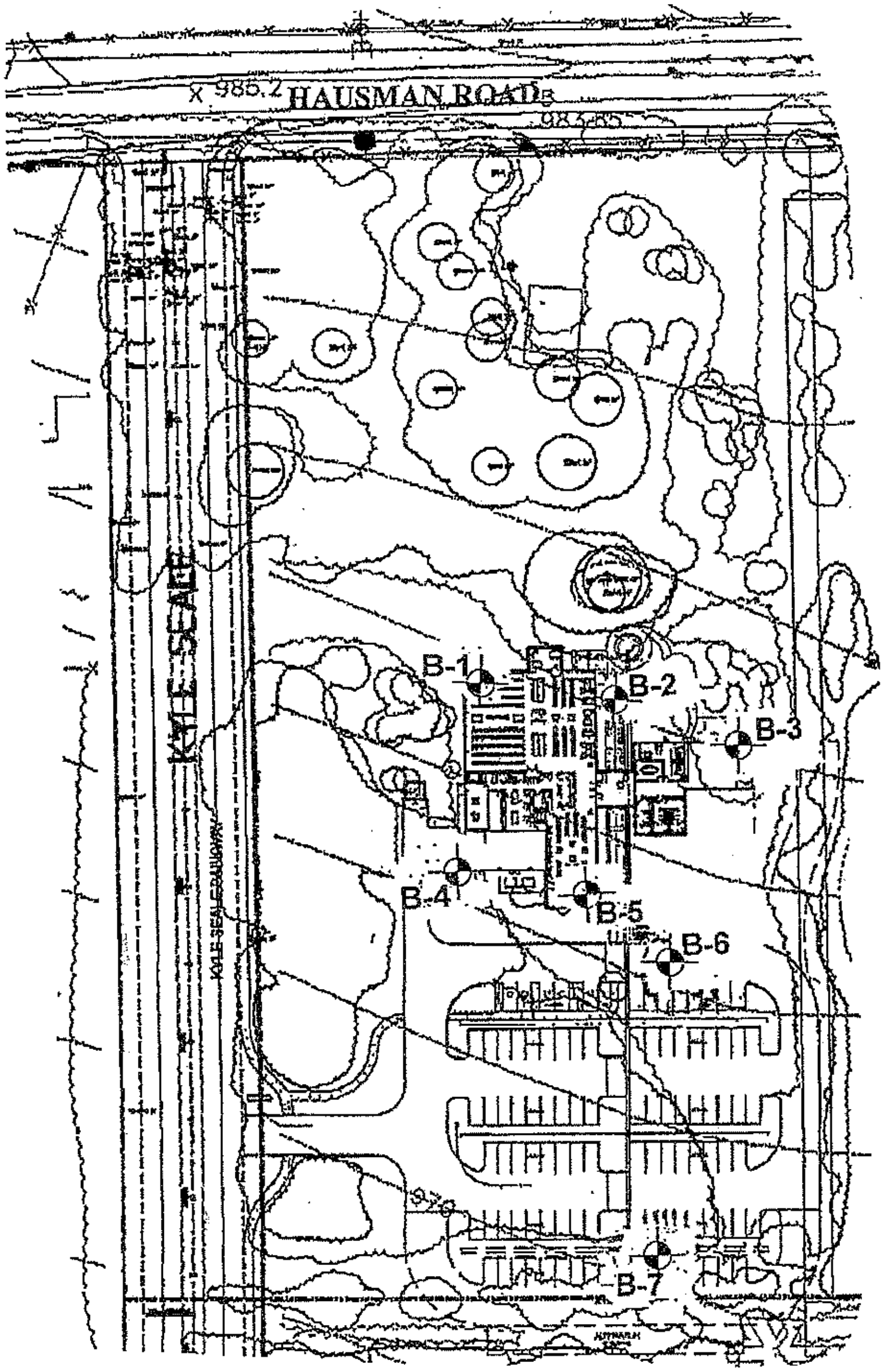
ILUSTRATIONS



Vicinity map taken from Delorme Street Atlas USA® (800) 452-5931

Scale 1 inch = 2 miles

VICINITY MAP
PROPOSED HAUSMAN ROAD LIBRARY
SAN ANTONIO, TEXAS



Not to Scale

PLAN OF BORINGS
PROPOSED HAUSMAN ROAD LIBRARY
SAN ANTONIO, TEXAS

LOG OF BORING NO. 1

PROPOSED HAUSMAN ROAD LIBRARY
SAN ANTONIO, TEXAS

TYPE: *Flight Auger*

LOCATION: *See Plate 2*

DEPTH, ft	BLOWS PER FOOT OR REC/(RQD), %	STRATUM DESCRIPTION	Layer Elev./ Depth	WATER CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX (PI), %	PASSING NO. 200 SIEVE, %	UNIT DRY WEIGHT, pcf	UNDRAINED SHEAR STRENGTH ksf
		CLAY (CH), brown, fat, hard, with calcareous nodules		15					107	12.2 (U)
		-reddish brown below 2'		14	57	18	39			4.5+ (P)
		CLAY (CL), tan, lean, hard, silty	4.0							
5	45									
		-with calcareous deposits, 4' to 10'								
	43									
		-with tan and gray clay seams and layers below 8'		16	45	11	34			
	50/7"									
10										
		LIMESTONE, tan, highly weathered, with soft seams and layers	11.0							
	ref/0.5"		13.6							
15										
		Note: No free groundwater was observed.								
20										

COMPLETION DEPTH: *13.6 ft*

DATE: *11-17-05*

PROJECT NO. *1005-0352*

U = Unconfined
Q= Unconsolidated-Undrained Triaxial
P = Pocket Penetrometer
T = Torvane

LOG OF BORING NO. 2

PROPOSED HAUSMAN ROAD LIBRARY
SAN ANTONIO, TEXAS

TYPE: *Flight Auger*

LOCATION: *See Plate 2*

DEPTH, ft	BLOWS PER FOOT OR REC/(RQD), %	STRATUM DESCRIPTION	Layer Elev./ Depth	WATER CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX (PI), %	PASSING NO. 200 SIEVE, %	UNIT DRY WEIGHT, pcf	UNDRAINED SHEAR STRENGTH ksf
		CLAY (CH), brown, fat, hard, with small roots		13	54	11	43			4.5+ (P)
		CLAY (CL), reddish tan, lean, hard, with calcareous deposits	2.0	11					108	9.6 (U)
		-tan, silty below 4'								
5	49									
	50	-with tan and gray, fat (CH), clay seams and layers below 6'		15	54	17	37	91		
	ref/4.5"									
10		LIMESTONE, tan, highly weathered, with clay seams and layers	10.5							
				5						
	ref/0"		13.6							
15		Note: No free groundwater was observed.								
20										

COMPLETION DEPTH: *13.6 ft*

DATE: *11-17-05*

PROJECT NO. *1005-0352*

U = Unconfined
Q= Unconsolidated-Undrained Triaxial

P = Pocket Penetrometer
T = Torvane

LOG OF BORING NO. 3

PROPOSED HAUSMAN ROAD LIBRARY
SAN ANTONIO, TEXAS

TYPE: *Flight Auger*

LOCATION: *See Plate 2*

DEPTH, ft	BLOWS PER FOOT OR REC/(RQD), %	STRATUM DESCRIPTION	Layer Elev./ Depth	WATER CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX (PI), %	PASSING NO. 200 SIEVE, %	UNIT DRY WEIGHT, pcf	UNDRAINED SHEAR STRENGTH ksf
		CLAY (CH), brown and tan, fat, hard, with calcareous deposits								4.5+ (P)
	34	CLAY (CL), tan, lean, hard, silty -very calcareous to 6'	2.0	5	32	17	15	84		
5	45									
	35	-with tan and gray, fat (CH), seams and layers, below 6'								
				9	51	17	34			
	43									
10										
	ref/2"	LIMESTONE, tan, highly weathered, with clay seams	13.0 13.7							
15		Note: No free groundwater was observed.								
20										

COMPLETION DEPTH: *13.7 ft*

DATE: *11-17-05*

PROJECT NO. *1005-0352*

U = Unconfined
Q= Unconsolidated-Undrained Triaxial
P = Pocket Penetrometer
T = Torvane

FUGRO CONSULTANTS

LOG OF BORING NO. 4

PROPOSED HAUSMAN ROAD LIBRARY
SAN ANTONIO, TEXAS

TYPE: *Flight Auger*

LOCATION: *See Plate 2*

DEPTH, ft	SYMBOL	SAMPLES	BLOWS PER FOOT OR REC/(RQD), %	STRATUM DESCRIPTION	Layer Elev./ Depth	WATER CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX (PI), %	PASSING NO. 200 SIEVE, %	UNIT DRY WEIGHT, pcf	UNDRAINED SHEAR STRENGTH ksf
				CLAY (CH), brown, fat, hard, with gravel		17	64	17	47	91		4.5+ (P)
												4.5 (P)
5			47	CLAY (CL), tan, lean, hard, with calcareous deposits	4.5							
			ref/3"	LIMESTONE, tan, highly weathered, with clay seams and layers	6.0	6						
			ref/0"									
10												
			ref/0"		13.6	4						
15				Note: No free groundwater was observed.								
20												

COMPLETION DEPTH: *13.6 ft*

DATE: *11-17-05*

PROJECT NO. *1005-0352*

U = Unconfined
Q= Unconsolidated-Undrained Triaxial
P = Pocket Penetrometer
T = Torvane

FUGRO CONSULTANTS

PLATE 6

LOG OF BORING NO. 5

PROPOSED HAUSMAN ROAD LIBRARY
SAN ANTONIO, TEXAS

TYPE: *Flight Auger* **LOCATION:** *See Plate 2*

DEPTH, ft	BLOWS PER FOOT OR REC/(RQD), %	STRATUM DESCRIPTION	Layer Elev./ Depth	WATER CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX (PI), %	PASSING NO. 200 SIEVE, %	UNIT DRY WEIGHT, pcf	UNDRAINED SHEAR STRENGTH ksf
		CLAY (CH), brown, fat, hard (possibly fill)								4.5+ (P)
	41	-light brown, lean (CL), silty, with chert gravel below 2'	2.0	9	46	18	28			
	40	CLAY (CL), tan, lean, hard -with calcareous deposits to 6'	4.5							
5	50/3"	-with tan and gray, fat clay (CH), seams and layers, below 6'		8	37	14	23			
	ref/5"									
		LIMESTONE, tan, highly weathered, with clay seams and layers	9.0							
10										
	ref/0"		13.6							
15		Note: No free groundwater was observed.								
20										

COMPLETION DEPTH: *13.6 ft*

DATE: *11-17-05* **PROJECT NO.** *1005-0352*

U = Unconfined
Q= Unconsolidated-Undrained Triaxial
P = Pocket Penetrometer
T = Torvane

FUGRO

LOG OF BORING NO. 6
PROPOSED HAUSMAN ROAD LIBRARY
SAN ANTONIO, TEXAS

TYPE: *Flight Auger*

LOCATION: *See Plate 2*

DEPTH, ft	SYMBOL	SAMPLES	BLOWS PER FOOT OR REC/(RQD), %	STRATUM DESCRIPTION	Layer Elev./ Depth	WATER CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX (PI), %	PASSING NO. 200 SIEVE, %	UNIT DRY WEIGHT, pcf	UNDRAINED SHEAR STRENGTH ksf
				CLAY (CH), brown, fat, hard		11						4.5+ (P)
						10					106	8.5 (U)
			41	CLAY (CL), light brown, lean, hard, with calcareous deposits	3.0	8	35	15	20			
5					5.0							
				Note: No free groundwater was observed.								
10												
15												
20												

COMPLETION DEPTH: *5.0 ft*

DATE: *11-17-05*

PROJECT NO. *1005-0352*

U = Unconfined
Q= Unconsolidated-Undrained Triaxial
P = Pocket Penetrometer
T = Torvane

LOG OF BORING NO. 7

PROPOSED HAUSMAN ROAD LIBRARY
SAN ANTONIO, TEXAS

TYPE: *Flight Auger*

LOCATION: *See Plate 2*

DEPTH, ft	SYMBOL	SAMPLES	BLOWS PER FOOT OR REC/(RQD), %	STRATUM DESCRIPTION	Layer Elev./ Depth	WATER CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX (PI), %	PASSING NO. 200 SIEVE, %	UNIT DRY WEIGHT, pcf	UNDRAINED SHEAR STRENGTH ksf
				CLAY (CH), brown, fat, hard								4.5+ (P)
				-with roots and small gravel, 2' to 4'		14	56	18	38			4.5+ (P)
				-light brown below 4'								4.5+ (P)
5					5.0							
				Note: No free groundwater was observed.								
10												
15												
20												

COMPLETION DEPTH: *5.0 ft*

DATE: *11-17-05*

PROJECT NO. *1005-0352*

U = Unconfined
Q= Unconsolidated-Undrained Triaxial

P = Pocket Penetrometer
T = Torvane

FUGRO CONSULTANTS

TERMS AND SYMBOLS USED ON BORING LOGS FOR SOIL

SOIL TYPES

CH, fat clays	SC, clayey sands	GC, clayey gravels	CL, lean clays
SM, silty sands	GM, silty gravels	ML, silts	SW, well-graded
GW, well-graded gravels	Fill, unclassified	SP, poorly-graded sands	GP, poorly-graded gravels

SOIL GRAIN SIZE

U.S. STANDARD SIEVE

	6"	3"	3/4"	4	10	40	200	
		GRAVEL		SAND				
		COARS	FINE	COARSE	MEDIUM	FINE		
	152	76.2	19.1	4.76	2.00	0.420	0.074	0.002

SOIL GRAIN SIZE IN MILLIMETERS

CONSISTENCY OF COHESIVE SOILS (2)

CONSISTENCY	UNDRAINED SHEAR STRENGTH
Very Soft	Less Than 0.25
Soft	0.25 to 0.50
Firm	0.5 to 1.00
Stiff	1.00 to 2.00
Very Stiff	2.00 to 4.00
Hard	greater than 4.00

CONDITION OF GRANULAR SOILS (2)

NUMBER OF BLOWS PER FT., N	RELATIVE DENSITY
0-4	Very Loose
4-10	Loose
10-30	Medium
30-50	Dense
Over 50	Very Dense

STRUCTURE (1)

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 6 mm thick.
Laminated	Alternating layers of varying material or color with the layers less than 6 mm thick.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusions of small pockets of different soils.

MOISTURE

Dry	-No water evident in sample; fines less than plastic limit.
Moist	-Sample feels damp; fines near the plastic limit
Very Moist	-Water visible on sample: fines greater than plastic limit and less than liquid limit
Wet	-Sample bears free water; fines greater than liquid limit

INCLUSIONS (1)

Parting	-Inclusion <1/8" thick extending through sample.
Seam	-Inclusion 1/8" to 3" thick extending through sample.
Layer	-Inclusion >3" thick extending through sample.
Trace	-<5% of sample.
Few	-5% to 10% of sample.
Little	-10 to 25 % of sample.
Some	-30% to 45% of sample.

REFERENCES:
1) ASTM D 2488

2) Peck, Hanson, and Thornburn, (1974), Foundation Engineering.

Information on each boring log is a compilation of subsurface conditions and soil and rock classifications obtained from the field as well as from laboratory testing of samples. Strata have been interpreted by commonly accepted procedures. The stratum lines on the logs may be transitional and approximate in nature. Water level measurements refer only to those observed at the times and places indicated, and may vary with time, geologic condition or construction activity.

TERMS AND SYMBOLS USED ON BORING LOGS FOR ROCK

ROCK TYPES

LIMESTONE	DOLOMITE	SANDSTONE
HIGHLY WEATHERED LIMESTONE	SHALE	CONGLOMERATE
DOLOMITIC LIMESTONE	CLAYSTONE	GRANITE

SAMPLER TYPES

Thin-walled Tube	Rock Core
Standard Penetration Test	Auger Sample
THD Cone	Dry Core

HARDNESS

Friable	-Crumbles under hard pressure
Low Hardness	-Can be carved with a knife
Moderately Hard	-Can be scratched easily with a knife
Very Hard	-Cannot be scratched with a knife

SOLUTION & VOID CONDITIONS

Void	Interstice; a general term for pore space or other openings in rock.
Cavities	Small solutional concavities.
Vuggy	Containing small cavities, usually lined with a mineral of different composition from that of the surrounding rock.
Vesicular	Containing numerous small, unlined cavities, formed by expansion of gas bubbles or steam during solidification of the rock.
Porous	Containing pore, interstices, or other openings which may or may not interconnect.
Cavernous	Containing cavities or caverns, sometimes quite large. Most frequent in limestones and dolomites.

WEATHERING GRADES OF ROCKMASS (1)

TERM	DESCRIPTION
Slightly	Discoloration indicates weathering of rock material and discontinuity surfaces
Moderately	Less than half of the rock material is decomposed or disintegrated to a soil
Highly	More than half of the rock material is decomposed or disintegrated to a soil.
Completely	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed.

JOINT DESCRIPTION

SPACING	INCLINATION	SURFACES
Very Close <2"	Horizontal 0-5	Slickensided-Polished, grooved
Close 2"-12"	Shallow 5-35	Smooth-Planar
Medium Close 12"-3'	Moderate 35-65	Irregular-Undulating or granular
Wide >3'	Steeply 65-85	Rough-Jagged or pitted
	Vertical 85-90	

BEDDING THICKNESS (2)

Very Thick	>4'
Thick	2'-4'
Thin	2"-2'
Very Thin	1/2"-2"
Laminated	0.08"-1/2"
Thinly-Laminated	<0.08"

REFERENCES:

1) British Standard (1981) Code of Practice for Site Investigation, BS 5930.

2) The Bridge Div.,Tx. Highway Dept. Foundation Exploration & Design Manual 2nd Edition, revised June, 1974.

Information on each boring log is a compilation of subsurface conditions and soil and rock classifications obtained from the field as well as from laboratory testing of samples. Strata have been interpreted by commonly accepted procedures. The stratum lines on the logs may be transitional and observed at the time and places indicated, and may vary with time, geologic condition or construction activity.

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

CITY OF SAN ANTONIO
DEPARTMENT OF CAPITAL IMPROVEMENTS MANAGEMENT SERVICES
CONTRACT SERVICES DIVISION

RECEIPT OF ADDENDUM NUMBER **TWO** IS HEREBY ACKNOWLEDGED FOR PLANS AND

SPECIFICATIONS FOR CONSTRUCTION OF **Bonnie Connor Park (Hausman Phase III (40-00089)**

FOR WHICH BIDS WILL BE OPENED ON **Tuesday, April 12, 2011**

THIS ACKNOWLEDGEMENT MUST BE SIGNED AND RETURNED WITH THE BID PACKAGE.

Company Name: ______________________

Address: ____________________________

City/State/Zip Code: ___________________

Date: _____________

____
Signature

____
Print Name/Title